A-94-09
V-D-10

Revised

Technical Support Document for
South Coast FIP Ozone Attainment Demonstration:
Stationary Sources
February, 1995

Inventory: For the final FIP, EPA is using inventories in South Coast's 1994 Air Quality Management Plan ("AQMP") and the November 1994 California State Implementation Plan for Ozone ("CARB SIP"). The 1994 AQMP and CARB SIP projects emissions through 2010. As described in the FIP proposal, EPA expected that the inventory used for the final FIP attainment demonstration would incorporate the updated 2010 inventory after it was finalized by SCAQMD and CARB. EPA is using these updated inventories in the final FIP. Mobile source emission inventory estimates are described in a companion mobile sources attainment year TSD created by EPA's Office of Mobile Sources (OMS).

Appendix A presents the 1990 and 2010 stationary and mobile emission estimates from the 1994 SCAQMD AQMP. The following table represents a comparison of 2010 stationary source attainment year emission inventory used in the FIP proposal compared to the revised estimate used in the final FIP.

Table 1. Comparison of proposed and final FIP 2010 Inventory

	Proposal		Final	
FIP 2010 inventory (tpd)	VOC	NOx	VOC	NOx
Stationary sources	757	212	727	106
Stationary source attainment target	116	69	207	99

The attainment targets represent the estimated level of stationary source emissions which the South Coast Air Basin could assimilate and still attain the National Ambient Air Quality Standards (NAAQS) for ozone (i.e., 0.12 ppm). The attainment targets for the South Coast Basin have been revised from 187 tpd VOC and 399 tpd NOx (in the proposal) to 323 tpd of VOC and 553 tpd of NOx. Table 1 indicates the remaining attainment year emissions for the stationary sources. These attainment targets are based on UAM simulations of actual ozone exceedance episodes and are consistent with those in the 1994 AQMP and CARB SIP.

Stationary Source Emission Reductions: Appendix B provides a summary of the emission reductions projected in 2010 as a result of the FIP measures. The basis of these reduction estimates is presented in the TSDs for each FIP measure, except for the cap regulations.

The stationary source reductions are based on credit for SIP 182(e)(5) measures; proposed category specific FIP measures (35 tpd VOC), the VOC and NOx cap programs (40 tpd VOC and 74 tpd NOx) and FIP 182(e)(5) measures (218 tpd VOC and 7 tpd NOx). The FIP inventories assume credit for previously adopted SCAQMD and CARB SIP measures but do not allow credit for measures which SCAQMD or CARB intend to adopt in the near future (except 182(e)(5) measures). EPA intends to take separate rulemaking actions for the submitted SCAQMD and CARB SIP measures as they are adopted and submitted.

EPA's projected 2010 reductions from SIP measures, category specific FIP measures, the cap program, and 182(e)(5) are listed in Appendix B. A summary of the reductions from the adopted SIP measures and category specific FIP measures is provided below in Table 2.

Table 2. Emissions after reductions from SIP and Category Specific FIP Measures.

	Proposal		Final	
	VOC	NOx	VOC	NOx
Initial 2010 baseline (tpd)	757	212	727	106
Reductions from SIP measures	62	63	227	0
Reductions from specific FIP measures	92	0	35	0
Remaining 2010 emissions	603	149	465	106

The proposed cap programs apply to stationary sources with VOC or NOx emissions of greater than 4 tons per year. A cap program for NOx was not fully proposed in the NPR because the SCAQMD had adopted its NOx RECLAIM program which provided significant NOx reductions from the majority of the greater than 4 tpy NOx sources.[1] However, EPA is including a NOx cap program in the final FIP.

In the proposal, EPA proposed a VOC cap program with an annual reduction rate of between 4-9% over a five-year period. EPA estimated in the proposal that VOC cap program emission reductions would be 80 tpd. This assumed an 8% per year reduction from an estimated cap source inventory of 200 tpd. The proposed cap program inventory did not include emissions and reductions from less than 4 tpy stationary sources and the area source categories (e.g., architectural coatings, consumer products, livestock waste, service stations, waste burning, pesticides, and other stationary source categories) estimated to be less than 4 tpy. These are not included in the final cap rules. In the proposal, EPA used a 200 tpd inventory estimate described in the SCAQMD's "Regional Clean Air Incentives Market Summary Recommendations," Spring 1992. The 200 tpd estimate assumed these facilities operate 250 days per year. After the FIP proposal, SCAQMD released inventory estimates for the potential

[1] Because EPA is not fully approving SCAQMD's NOx RECLAIM program at this time, EPA is including a NOx cap program in the FIP. EPA has not factored these emissions back into the FIP inventory or taken credit for the NOx cap reductions because the baseline already reflects the reductions expected from NOx RECLAIM.

source to be included in their VOC RECLAIM program. Based on this new information, EPA has revised the inventory estimate of the sources included in the VOC cap program. The inventory estimate used for the final FIP is now approximately 110 tpd. EPA has also finalized a 9% per year reduction rate for the VOC cap program. The expected reductions from the cap program are approximately 40 tpd (i.e., 50 tpd less 80% rule effectiveness). The affect of the cap program on the remaining projected inventory is summarized below in Table 3.

Table 3. Cap Program Reductions

	Proposal		Final	
	VOC	NOx	VOC	NOx
Remaining 2010 baseline (tpd)	603	149	465	106
Cap Program	82	0	40	0
Remaining 2010 emissions	523	149	425	106

In the proposal, remaining emissions after the cap program were approximately 523 tpd of VOC and 149 tpd of NOx; these estimates included all remaining stationary and area source emissions. The revised estimate of remaining emissions after the cap program is now 425 tpd VOC and 149 tpd NOx. In order to achieve the revised stationary source attainment target of 207 tpd of VOC and 99 tpd for NOx, additional reductions of approximately 218 tpd for VOC and 7 tpd for NOx are needed. These reductions will be covered through FIP 182(e)(5) commitments. The FIP 182(e)(5) reductions will ultimately depend on the amount of reductions achieved through continued SIP progress by SCAQMD, CARB, and EPA. The affect of the 182(e)(5) program on the projected inventory is summarized below in Table 4.

Table 4. 182(e)(5) Reductions

	Proposal		Final	
	VOC	NOx	VOC	NOx
After cap 2010 emissions (tpd)	503	149	425	106
FIP 182 (e)(5) Commitments	407	80	218	7
Remaining 2010 emissions	116	69	207	99
Stationary source attainment target	116	69	207	99

As mentioned earlier, the details of the mobile source reductions are provided in previously described companion TSDs generated by EPA's Office of Mobile Sources. Summaries of the FIP reductions and attainment demonstration are provided in Tables 5 and 6.

Table 5. Stationary Source Reduction Summary

	Proposal		Final	
	VOC	NOx	VOC	NOx
Initial stationary source 2010 baseline (tpd)	757	211	727	106
Minus Reductions from Stationary Sources				
Credit for SIP measures	62	63	227	0
Category specific FIP measures	92	0	35	0
Cap program	80	0	40	0
182 (e)(5) commitments	407	80	218	7
Emissions Remaining: stationary sources	116	69	207	99

Table 6. Attainment Year Reduction Summary (Final)

	VOC	NOx
FIP 2010 inventory (tpd)		
Mobile Sources	363	826
Stationary sources	727	106
Reductions		
SIP measures (including 182(e)(5))	319	106
FIP category specific	191	227
FIP 182(e)(5)	257	47
Remaining 2010 emissions	323	553
Attainment Year Targets	323	553

[The following appendices and attachments are not available electronically but can be obtained be contacting EPA Region 9.]

Attachments[2]

1. South Coast 1994 Air Quality Management Plan.

2. South Coast 1994 Air Quality Management Plan, Appendix III-B, Current and Future Seasonal Emissions for the South Coast Air Basin: Planning Inventories.

3. The California State Implementation Plan for Ozone, Volumes I-IV, November 15, 1994.

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[2] Cover page only and/or key pages; for entire copies of any of these documents, please contact EPA Region 9 or South Coast AQMD.

FINAL

1994 Air Quality Management Plan

Meeting the Clean Air Challenge

September 199[illegible]

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

SCAG
SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

(from 1994 SC AQMP)

APPENDIX III-B

CURRENT AND FUTURE PLANNING EMISSIONS IN THE SOUTH COAST AIR BASIN

California Environmental Protection Agency
AIR RESOURCES BOARD

THE CALIFORNIA STATE IMPLEMENTATION PLAN FOR OZONE

Volume I:

OVERVIEW OF THE CALIFORNIA OZONE SIP

Adopted: November 15, 1994

California Environmental Protection Agency
AIR RESOURCES BOARD

THE CALIFORNIA STATE IMPLEMENTATION PLAN FOR OZONE

Volume II:

THE AIR RESOURCES BOARD'S MOBILE SOURCE AND CONSUMER PRODUCTS ELEMENTS

Adopted: November 15, 1994

California Environmental Protection Agency
AIR RESOURCES BOARD

THE CALIFORNIA STATE IMPLEMENTATION PLAN FOR OZONE

Volume III:

STATUS OF ENHANCED MOTOR VEHICLE INSPECTION & MAINTENANCE AND PESTICIDE CONTROL MEASURES

Adopted: November 15, 1994

California Environmental Protection Agency
AIR RESOURCES BOARD

THE CALIFORNIA STATE IMPLEMENTATION PLAN FOR OZONE

Volume IV:

LOCAL EMISSION CONTROL PLAN AND ATTAINMENT DEMONSTRATIONS

Adopted: November 15, 1994

Appendix A

VOC & NOx Emission Inventory

1987 thru 2010

from

South Coast 1994 AQMP

(from 1994 SC AQMP)

APPENDIX III-B

CURRENT AND FUTURE PLANNING EMISSIONS IN THE SOUTH COAST AIR BASIN

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES (CONTINUED)

LIST OF FIGURES

LIST OF ACRONYMS

AQMP	Air Quality Management Plan
ARB	California Air Resources Board
CALTRANS	California Department of Transportation
CAT	Catalytic Converters
CEC	California Energy Commission
CO	Carbon Monoxide
DTIM	Direct Travel Impact Model
EDS	Emission Data System
EIS	Emissions Inventory System
EPA	Environmental Protection Agency
ERC	Emission Reduction Credits
HD	Heavy-Duty
LDV	Light-Duty Vehicles
MDV	Medium-Duty Vehicles
NCAT	Non-Catalytic Converters
NO_x	Oxides of Nitrogen
NSR	New Source Review
PM	Particulate Matter
PM10	Particulate Matter Less Than 10 Microns In Diameter
RECLAIM	Regional Clean Air Incentives Market
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCC	Source Classification Code
SIC	Standard Industrial Code
SO_x	Oxides of Sulfur

LIST OF ACRONYMS (CONTINUED)

TOG	Total Organic Gases
UTM	Universal Transverse Mercator
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compounds

I.1 BACKGROUND

In 1990, pollutant concentrations in the atmosphere of the South Coast Air Basin (Basin) exceeded four of the six federal ambient air quality standards -- specifically, the standards for ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), and PM10. The federal standards for lead and sulfur dioxide (SO_2) were not exceeded.

The challenge of bringing Basin air quality into compliance with the state and federal standards is complicated by the fact that ambient concentrations of ozone are typically at their highest during the summer (defined as May through October for planning purposes) while those for CO and NO_2 are generally highest during the winter months (November through April). Appendices II-A and II-B contain detailed information on Basin air quality. Any strategy designed to mitigate air pollution in the Basin must consider this seasonal variation in ambient air quality.

In this document, emission levels of air contaminants in the Basin during episodes of *poor air quality* (planning inventories) are compiled for the base years 1987 and 1990 and forecast to the years 1994, 1996, 1997, 1999, 2000, 2002, 2005, 2007, 2008 and 2010. These are baseline projections based on socioeconomic forecasts and include the impact of adopted air pollution regulations. The 1987 planning inventory is reconstructed following the same methodology as described in Appendix III-A, Section III.2. The summer, or ozone, planning inventory contain emissions of it ozone precursors (i.e. VOC and NO_x) during that season, whereas winter, CO and NO_2, planning inventory represent emission levels during winter. These planning inventories provide the basis for tracking emission reduction progress specified by the federal Clean Air Act (CAA) and California Clean Air Act (CCAA). The CAA requires the South Coast Air Quality Management District (SCAQMD) to produce a plan for reducing all nonattainment pollutants or their precursors by fifteen percent between 1990 and 1996, and three percent each year thereafter, averaged every consecutive three years until reaching the attainment date. The CCAA requires emission reductions by five percent or more per year, averaged every consecutive three years until 2000. In addition, the CAA specifies 1990 as the base year, whereas the CCAA specifies 1987. As in Appendix III-A, only anthropogenic sources (those associated with human activity) are listed in this appendix. Background emissions from natural sources, such as vegetation and wind erosion, are not presented in this Appendix. Refer to Appendix III-A for a presentation of average daily emissions (for both base and future years) including a description of terminology, types of emission sources, the inventory database, and an overview of the methodology for estimating emissions.

I.2 PLANNING INVENTORIES

Planning inventories are also referred to as seasonal inventories. As this section will outline, there are four major differences between planning inventories and average annual day inventories. First, planning inventories present emissions only for those air pollutants or their precursors for which the area is in nonattainment with state or federal standards. Also, emission levels are representative of those that occur during the typical season of violations. For example, the CO planning inventory lists emission levels of CO that occur

during the winter. In contrast, average annual day inventories list daily emission levels for all of the criteria air contaminants or their precursors.

Second, in a planning inventory, point source emission estimates represent an "average annual operating day." Emissions from point sources are calculated by dividing the total annual emissions produced by a source by the number of days the source was in operation. For example, if a printing company emitted 150 tons in a year and the printing production lines operated 5 days a week for 40 weeks, then the average operating emissions from this facility are calculated to be 150 tons divided by 200 days or 0.75 tons per day. Average annual day emissions inventories, on the other hand, estimate daily emissions from point sources by dividing the annual emissions by 365. Although emissions of volatile organic compounds (VOC) from some sources may depend on the ambient temperature or other meteorological factors, adjustments are not currently made for these parameters, staff of the state Air Resources Board (ARB) is currently evaluating possible adjustments.

Third, in the planning inventory, area source emission estimates represent an "average seasonal operating day." As an example, VOC emissions produced by asphalt road-paving operations are calculated by taking into account the variation in monthly levels and weekly operating days for paving activity during the year. Road paving varies from maximum rates during the summer season to minimum levels during the winter season Paving activity varies throughout the week with, on average, five operating days in a week. The allocation of annual area source emissions among the seasons is based on estimated relative monthly and weekly emissions patterns. Since area source categories were estimated both by ARB and SCAQMD, temporal information was developed by the respective agency. Conversely, in an average annual day inventory, area source annual emissions are divided by 365 to estimate average daily emissions. As with point source emissions, the area source inventory was not adjusted for ambient temperature.

Fourth and finally, motor vehicle emissions in a planning inventory are calculated using temperature profiles representative of ten days with the worst air quality. The days are divided into six time periods, and temperature data for each period is developed. Daily average motor vehicle activity, including vehicle miles traveled, percent of vehicle miles traveled in specific speed ranges, and number of trips, is then assigned to each of the six time periods. Emission factors, currently calculated by the computer model EMFAC7F, are then applied to activity. The emissions estimates are currently calculated by the computer model BURDEN7F using activity data and emission factors. Conversely, in the average annual day inventory, motor vehicle emissions are estimated by summing sixty percent of the summer planning inventories and forty percent of the winter planning inventories. (Detailed on-road mobile emission calculations are discussed in Appendix III-A, Section I.1.) Table 1-1 summarizes the major differences between planning and average annual emission inventories.

I.3 AIR CONTAMINANTS

In this appendix, two separate planning inventories, summer-ozone, and winter-CO, and NO_2 are compiled for emission levels occurring during the season when concentrations of criteria air contaminants are most likely to exceed the ambient air quality standards. Each

inventory contains base year emission levels of the nonattainment air contaminant or its precursors, i.e. those emissions that react in ambient air to form criteria air contaminants.

The winter planning inventory lists emission levels of CO and NO_2, respectively, for an average winter day. The summer planning inventory lists average summer day emission levels of VOCs and NO_x, as they are precursors to the photochemical formation of ozone in sunlight. VOCs include all gaseous compounds containing the element carbon with the exception of: 1) the organic gases methane, methylene chloride, methylchloroform and a number of Freon-type compounds; and, 2) the inorganic compounds carbon monoxide (CO), carbon dioxide (CO_2), carbonic acid, carbonates and metallic carbides. It should be noted that this definition of VOC is different from the one used by EPA, which excludes ethane.

I.4 TYPES OF SOURCES

Stationary sources of emissions are broadly grouped into: 1) point sources, with one or more permitted pieces of equipment in a fixed, identifiable location, and 2) area sources, consisting of numerous small facilities (e.g., gas stations) or pieces of equipment (e.g., residential water heaters and architectural coatings). Area sources do not have specifically identified locations but their emissions may be calculated using socioeconomic data.

Mobile sources are broadly characterized as on-road mobile sources and other mobile sources. On-road mobile sources include light-duty passenger vehicles; light-, medium-, and heavy-duty trucks; motorcycles; and urban buses. Other mobile sources include off-road vehicles, trains, ships, aircraft, and mobile equipment. For the planning inventories, emissions from on-road mobile sources were estimated using diurnal temperature profiles representative of the temperatures that occurred during the ten worst air quality episodes of the years 1986, 1987, and 1988. The ten worst days were selected for each non-attainment pollutant. Estimates of emissions from other mobile sources do not include these temperature corrections; instead, they are adjusted to reflect seasonal variations in activity rates throughout the year.

TABLE 1-1

Major Differences Between Planning Inventories and Average Annual Day Inventories

Planning Inventories (Seasonal)	Average Annual Day Inventories
1. Only list emissions for non-attainment pollutants or their precursors, at levels representative of typical season of violations (e.g., Summer - VOC/NO_x or Winter - CO/NO_2).	1. List average daily emission levels for all criteria air contaminants or their precursors.
2. Point source emission estimates represent "average annual operating day", (i.e., total emissions divided by operating days).	2. Point source emission estimates are derived by dividing total annual emissions by 365.
3. Area source emission estimates represent an "average seasonal operating day", (i.e., based on relative monthly and weekly patterns).	3. Area source annual emissions are divided by 365 to estimate average daily emissions.
4. Motor vehicle emissions are calculated using diurnal temperature profiles representing ten days of worst air quality. Daily average motor vehicle activity (e.g., VMT, Vehicle Trips, % miles per speed range) is assigned to six daily time periods, then emission factors (using EMFAC7F model) are applied to activity, and emission estimates are calculated with BURDEN7F model.	4. Motor vehicle emissions are estimated by summing 60% of summer inventory and 40% of winter inventory.

II.1 INTRODUCTION

This chapter presents emissions data for two planning inventories: summer-ozone, winter-CO, and NO_2. Data is summarized for the entire Basin for both stationary and mobile sources. Emissions data is compiled for the years 1987, 1990, 1994, 1996, 1997, 1999, 2000, 2002, 2005, 2007, 2008, and 2010. Baseline emission forecasts are based on a specific set of growth rates for population, industry, and motor vehicle activity developed by SCAG (1993-1994) with modification wherever necessary to better represent emission projections and reflect the impact of all air pollution control rules adopted prior to July 31, 1994 with a few exceptions. Refer to Appendix III-A for a description of methodology and a listing of growth and control factors contained in the emissions forecast.

Table 2-1A shows 1990 emission levels in the Basin and, for comparison, presents average annual day emissions. Overall, planning inventory emissions are higher than those of the average annual day in tons/day. A comparison between planning inventory and average annual day emissions by source category identifies an exception that the average annual day on-road inventory for ozone is higher than its planning (summer) inventory. That is because ARB estimates the average annual day on-road emissions by weighting sixty percent of summer inventory levels and forty percent of winter inventory levels. Since the winter on-road VOC and NO_x are higher than summer due to higher Reid vapor pressure in the winter time and mild winter temperatures, this results in higher average annual day on-road emissions for VOC and NO_x. Average winter day CO emissions are 17% higher than an average annual day. This implies that CO levels have substantial seasonal variations. NO_x emissions are relatively constant, with winter levels slightly higher than summer, due in part to increases in fuel consumption for water and space heating during the winter months. NO_x emissions for an average annual day are lower than for either summer or winter averages by 5.5%, and 10% respectively, as a consequence of different averaging procedures (see Section I.2).

TABLE 2-1A

Total 1990 Emissions in the South Coast Air Basin
(Tons/Day)

	Annual Average			Summer		Winter	
	VOC	NO_x	CO	VOC	NO_x	CO	NO_2
STATIONARY	585	217	113	666	235	147	252
ON-ROAD	761	762	5,342	701	746	6,127	785
OFF-ROAD	124	311	1378	150	380	1,716	383
TOTAL	1,470	1,290	6,833	1,517	1,361	7,990	1,419

II.2 EMISSIONS SUMMARY TABLES

Emissions data is summarized in two different forms: major source category, and control category. In this Appendix, all the emission summary tables by control category do not include the adopted NO_x RECLAIM emissions or the emissions from Emission Reduction Credit (ERC). Table 2-1B contains the NO_x RECLAIM emission allocations for the future years. The emissions from ERCs, that may be used in the future as offsets, are 10.83, 2.98, and 2.47 tons/day for VOC, NO_x, and CO, respectively. No adjustments were made to ERCs or RECLAIM allocations to account for potential seasonal variations.

TABLE 2-1B

NO_x RECLAIM Allocations (tons/day)

	1994	1996	1997	1999	2000	2002	2003-2010
NO_x	102.46	80.81	69.98	48.33	37.50	31.31	28.21

A major source category refers to a group of emission sources with similar characteristics. Emissions for stationary sources result primarily from the combustion of fuels, evaporation of solvents or fuels, and processing of materials. This is reflected in the District's emission inventory by the major source categories: fuel combustion; waste burning; solvent use; petroleum processing, storage, and transfer; industrial processes; and other miscellaneous processes. Mobile sources are subdivided into on-road and other mobile sources. A control category represents types of operations or sources that are either controlled or may be controlled in the future.

Detailed emissions and fuel use data are provided for on-road vehicles registered in California. Automobiles and trucks are subdivided into those using diesel fuel, unleaded gasoline (i.e., with catalytic converters), and leaded gasoline (i.e., without catalytic converters). Trucks are further subdivided into light-, medium-, and heavy-duty trucks. Different types of motor vehicle activity are distinguished, including vehicle miles traveled (VMT) and the number of hot-starts, cold-starts, and daily trips. Both exhaust and evaporative emissions are presented by mode of operation for each contaminant. A description of the methods used to determine exhaust and evaporative emissions from on-road motor vehicles is given in *Methodology to Calculate Emission Factors for On-Road Motor Vehicles* (ARB, 1993).

Summer-Ozone

The summer-ozone planning inventory is presented in Tables 2-2 through 2-20. Both stationary and mobile source emissions data, representative of summer levels, are compiled for 1987, 1990, 1994, 1996, 1997, 1999, 2000, 2002, 2005, 2007, 2008, and 2010. VOC and NO_x emissions data for the entire Basin is summarized by major source category (Tables 2-2 and 2-3 respectively) and by control category (Tables 2-4 through 2-15). Detailed emissions and fuel use data for in-use on-road motor vehicles in the Basin are listed for the year 1990 (Table 2-16), 1996 (Table 2-17), 2000 (Table 2-18), 2005 (Table 2-19), and 2010 (Table 2-20).

Winter-CO and NO_2

The winter inventory is compiled in Tables 2-21 through 2-39. Both CO and NO_x emissions produced by stationary and mobile sources during the winter are tabulated for the years: 1987, 1990, 1994, 1996, 1997, 1999, 2000, 2002, 2005, 2007, 2008 and 2010. CO and NO_x emissions are presented for the Basin by major source category (Tables 2-21 and 2-22) and by control category (Tables 2-23 through 2-34). Detailed emissions data for in-use on-road motor vehicles in the Basin are listed for the years 1990 (Table 2-35), 1996 (Table 2-36), 2000 (Table 2-37), 2005 (Table 2-38), and 2010 (Table 2-39).

III.1 INTRODUCTION

This chapter summarizes relative contributions to emission levels of VOC, NO_x, and CO in the Basin using data from the planning inventories presented in the previous chapter (i.e. Tables 2-2 through 2-39). Figure 3-1 highlights the relative distribution of emissions for each of the two planning inventories by source category, including point, area, on-road and off-road, for the year 1990. Figure 3-2 illustrates the relative contribution of emissions by source category for the year 2010. As discussed in Appendix III-A, Section II-2, mobile sources are major contributors of planning inventories for 1990. More stringent on-road standards in the future significantly reduce the on-road mobile sources contribution of VOC and CO to the total inventories in 2010.

III.2 COMPARISON BETWEEN ORIGINAL AND REVISED 1987 INVENTORIES

As discussed in Chapter 3 of Appendix III-A, the 1987 emission inventory has been revised since the adoption of the 1991 AQMP to reflect improvements in inventory methodology. The most noticeable changes are in on-road mobile (model EMFAC7F replaces EMFAC7E), and in a methodology change for off-road mobile. Figure 3-3 compares the 1987 emissions used in the 1991 AQMP and the reconstructed 1987 emissions used in the 1994 Plan. Overall, VOC and NO_x increase by about 5 to 10% and CO by 27% in the reconstructed 1987 inventory.

III.3 EMISSIONS FOR BASE YEAR 1990

Summer-Ozone

VOC emissions during the summer of 1990 averaged 1517 tons/day distributed between stationary (44%) and mobile sources (56%) (Figure 3-1). Of the stationary sources (Table 2-2), solvent use and surface coating operations contributed the highest amount of VOC emissions (405 tons/day). Light- and medium-duty vehicles accounted for most of the mobile source emissions.

In contrast to VOC, the bulk of the 1361 tons/day of summer NO_x emissions were produced by mobile sources (83%; Table 2-3). Mobile source NO_x emissions were produced predominantly by light- and medium-duty automobiles (427 tons/day) and diesel trucks (239 tons/day).

Winter-Carbon Monoxide

Total CO emissions during the winter of 1990 averaged 7990 tons/day. Ninety-eight percent of total CO emissions were produced by mobile sources (Table 2-21). Light-duty autos were the single largest source of emissions, producing 4186 tons/winter day, with light- and medium-duty trucks a distant second (1308 tons/day).

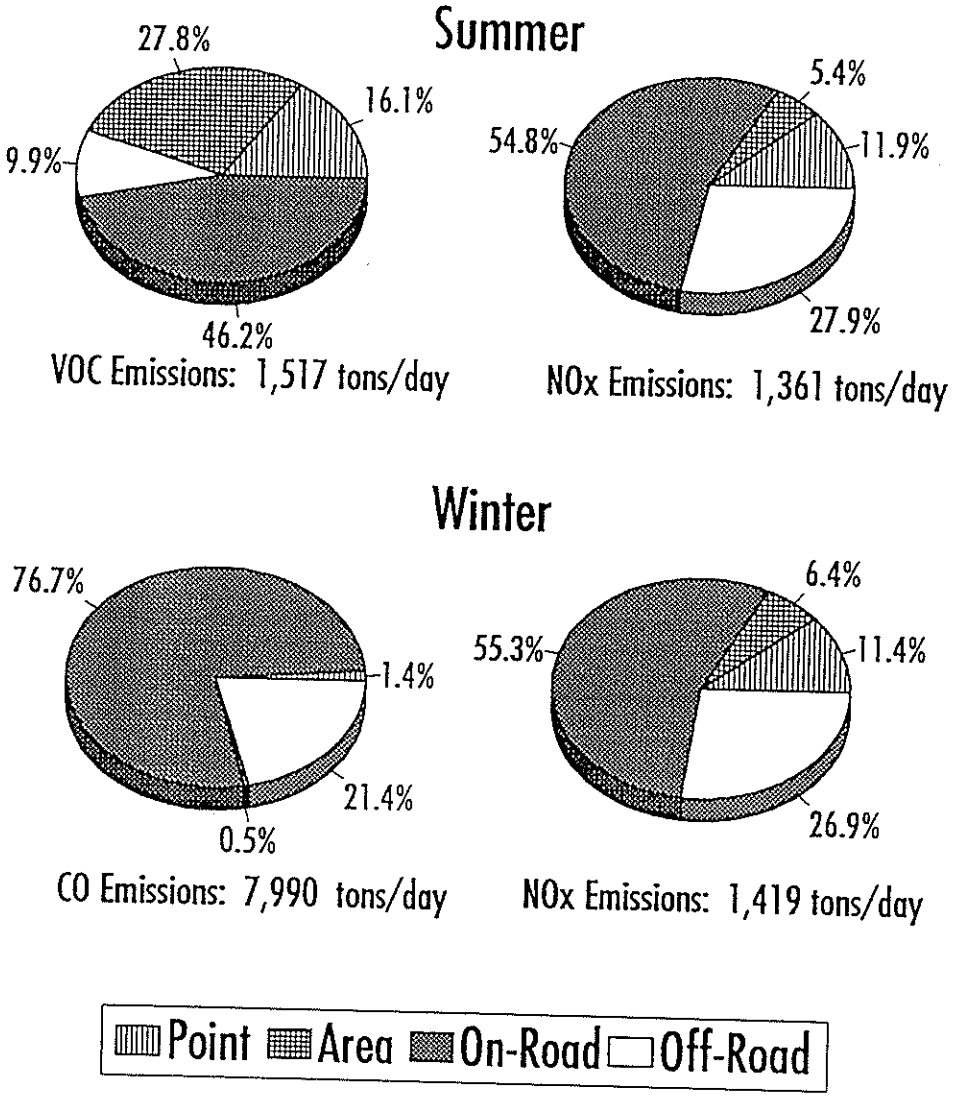


FIGURE 3-1

Relative Contribution by Source Category to 1990 Planning Inventory

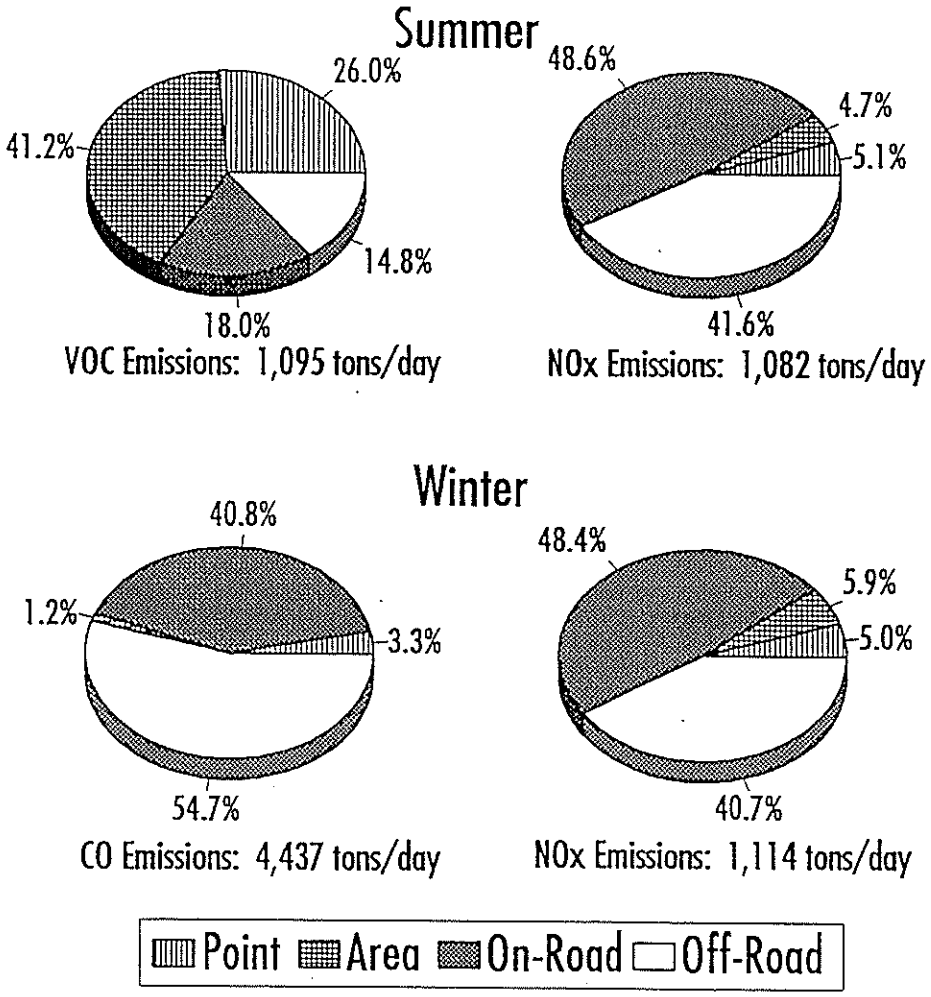
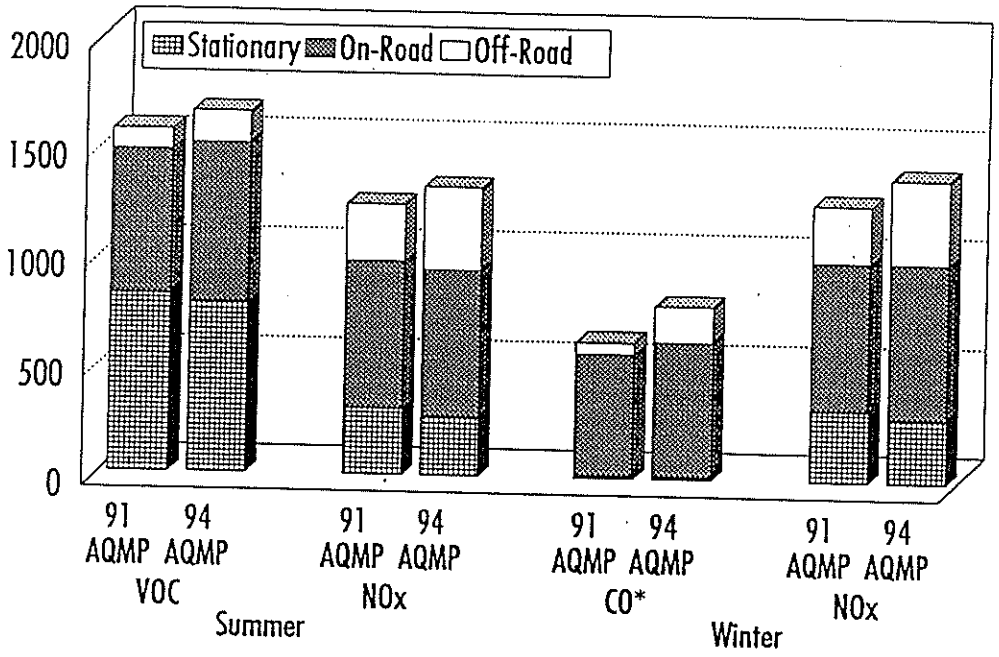


FIGURE 3-2
Relative Contribution by Source Category to 2010 Planning Inventory



*Emission values were divided by 10.

FIGURE 3-3

Comparison of Original and Reconstructed 1987 Emission Inventories

Winter-Nitrogen Dioxide

NO_2 emissions during the winter, 1419 tons/day, were slightly higher than the average summer day emission levels (1361 tons/day; Tables 2-3 and 22). Over half of the winter NO_2 emissions were produced by on-road mobile sources, 785 tons/day. As in the ozone planning inventory, winter emissions of NO_2 by mobile sources were mostly due to light-duty autos (353 tons/day) and diesel trucks (239 tons/day).

III.4 BASELINE EMISSIONS FOR FUTURE YEARS

Summer-Ozone

Forecasts of VOC emissions show a 26% decrease in total emissions, from 1517 tons/day in 1990 to 1125 tons/day in 2000. The trend between the years 2000 and 2010 shows a predicted 3% decrease in total VOC emissions, to 1094 tons/day in 2010 (Table 2-2). The distribution of VOC emissions varies with time. For example, the future shows a significant decrease in the emissions contributed by on-road mobile sources -- from 46% of total VOC emissions in 1990 to 18% in 2010. Conversely, area sources are predicted to contribute a higher percentage of total emissions in the future, rising from 28% of total emissions in 1990 to 41% in 2010.

Total summer NO_x emissions are expected to decrease by 21% between the years 1990 and 2000, from 1361 tons/day in 1990 to 1080 tons/day by the year 2000 (Table 2-3). The trend of decrease levels off between the years 2000 and 2010 with a total NO_x emissions of 1082 tons/day in 2010. The relative contribution to total emissions by stationary sources decreases from 17% to 12% and the mobile source contribution increases from 83% to 88% between the years 1990 and 2010. The summer planning inventory trend is very similar to that of average annual day emissions (see Appendix III-A, Section II.2).

Winter-Carbon Monoxide

Winter emissions of CO are expected to decrease 46% between the years 1990 and 2010, from 7990 tons/day in 1990 to 4438 tons/day in 2010 (Table 2-21). CO emissions are also predicted to decrease between the years 2000 and 2010. The relative contribution to total emissions varies between the years 1990 to 2010 with the on-road mobile source contribution decreasing from 77% to 41% while other mobile source contributions increase from 22% to 55% of total winter CO emissions.

Winter-Nitrogen Dioxide

As with summer NO_x emissions, total winter NO_2 emissions are predicted to decrease from the years 1990 to 2000 (21%), from 1419 tons/day in 1990 to 1117 tons/day in 2000 (Table 2-22). Between the years 2000 and 2010, NO_2 emissions stay relatively constant at about 1114 tons/day. The relative contribution to total winter NO_2 emissions by stationary sources falls from 18% to 11%, and mobile sources rise from 82% to 89% between 1990 and 2010. The winter NO_2 inventory trend is also very similar to the average annual day inventories (see Appendix III-A, Section II.2).

III.5 IMPACT ON GROWTH

Despite of the stringent air quality regulations adopted as of July 31, 1994, baseline emissions of criteria air pollutants will not decrease appreciably between the years 1990 and 2010. This is a consequence of regional growth in population, housing, and motor vehicle use. The impact of growth on future planning inventories is similar to that illustrated in Appendix III-A for the average annual day inventories.

REFERENCES

ARB, 1991. Methodology to Calculate Emission Factors for On-Road Motor Vehicles.

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SCAG, 1989. Regional Growth Management Plan.

SCAQMD, 1991a. 1991 Air Quality Management Plan.

SCAQMD, 1991b. 1987 Emission Inventory for the South Coast Air Basin: Average Annual Day. 1991 Air Quality Management Plan, Appendix III-A.

SCAQMD, 1991c. Future Baseline Emissions Inventory for the South Coast Air Basin: Average Annual Day. 1991 Air Quality Management Plan, Appendix III-B.

SUMMARY OF EMISSIONS
BY
MAJOR SOURCE CATEGORY

Table 2-3
Summary of Emissions
1990 Planning Emission Inventory for the South Coast Air Basin
(Tons per Day)

Excluding Natural Sources
Base Year: 1990

Source Category	Summer		Winter	
	VOC	NO_x	CO	NO_x
Stationary Sources				
Fuel Combustion				
Agricultural	0.00	0.02	0.00	0.02
Oil And Gas Production	0.96	1.20	1.81	1.20
Petroleum Refining	2.57	6.20	15.45	6.20
Other Manufacturing/industrial	4.05	50.00	28.45	51.39
Electric Utilities	1.28	1.12	6.42	1.12
Other Services And Commerce	5.02	26.61	33.00	27.50
Residential	0.84	25.05	17.69	39.25
Other	2.01	15.37	19.41	15.37
Total Fuel Combustion	16.74	125.57	122.23	142.05
Waste Burning				
Agricultural - Debris	0.07	0.00	0.32	0.00
Range Management	0.22	0.00	3.60	0.00
Incineration	0.21	0.82	0.71	0.82
Other	0.56	0.96	1.77	0.96
Total Waste Burning	1.06	1.78	6.40	1.78
Solvent Use				
Dry Cleaning	10.21	0.04	0.00	0.04
Degreasing	41.90	0.06	0.01	0.06
Architectural Coating	67.21	0.00	0.00	0.00
Other Surface Coating	148.50	0.39	0.29	0.39
Asphalt Paving	1.99	0.00	0.00	0.00
Printing	11.56	0.03	0.01	0.03
Consumer Products	107.90	0.00	0.00	0.00
Industrial Solvent Use	12.64	0.07	0.01	0.07
Other	3.04	0.01	0.01	0.01
Total Solvent Use	404.98	0.60	0.33	0.60
Petroleum Process, Storage & Transfer				
Oil And Gas Extraction	21.53	0.14	0.19	0.14
Petroleum Refining	38.66	1.12	4.29	1.12
Petroleum Marketing	50.56	0.04	0.01	0.04
Other	3.02	0.08	0.70	0.08
Total Petroleum Process, Storage & Transfer	113.77	1.38	5.19	1.38
Industrial Processes				
Chemical	8.02	0.32	0.49	0.32
Food And Agricultural	33.10	0.09	0.01	0.09
Mineral Processes	0.55	0.66	1.36	0.66
Metal Processes	0.70	0.58	1.47	0.58
Wood And Paper	0.01	0.01	0.00	0.01
Other	8.60	0.05	0.02	0.05
Total Industrial Processes	51.00	1.71	3.35	1.71

Table 2-3
Summary of Emissions
1990 Planning Emission Inventory for the South Coast Air Basin
(Tons per Day)

Excluding Natural Sources
Base Year: 1990

Source Category	Summer		Winter	
	VOC	NO_x	CO	NO_x
Miscellaneous Processes				
Pesticide Application	12.65	0.00	0.00	0.00
Farming Operations	54.04	0.00	0.00	0.00
Contruction And Demolition	0.00	0.00	0.00	0.00
Entrained Road Dust - Paved	0.00	0.00	0.00	0.00
Entrained Road Dust - Unpaved	0.00	0.00	0.00	0.00
Unplanned Fires	0.60	0.19	8.20	0.19
Waste Disposal	4.33	0.00	0.00	0.00
Fugitive Windblown Dust	0.00	0.00	0.00	0.00
Other	6.57	1.98	1.22	1.98
Total Miscellaneous Processes	76.72	2.17	9.42	2.17
RECLAIM Sources	---	101.99	---	101.98
Emission Reduction Credits	---	---	---	---
Total Stationary Sources	665.77	235.20	146.92	251.67
Mobile Sources				
On-Road Vehicles				
Light Duty Passenger	483.04	319.57	4178.49	352.59
Light And Medium Duty Trucks	140.91	108.30	1305.93	119.44
Heavy Duty Gas Trucks	32.95	66.99	485.65	61.87
Heavy Duty Diesel Truck	36.36	239.85	127.75	239.00
Motorcycles	6.36	1.30	21.82	1.45
Heavy Duty Diesel Urban Buses	1.71	10.46	7.43	10.42
Total On-Road Vehicles	701.33	746.47	6127.07	784.77
Other Mobile				
Off-Road Vehicles	39.06	10.89	137.45	9.41
Trains	1.52	31.53	4.84	32.06
Ships	1.16	33.41	2.41	32.98
Aircraft - Government	6.30	2.67	14.09	2.67
Aircraft - Other	9.91	10.52	70.34	10.52
Mobile Equipment	68.21	289.80	1326.18	294.36
Utility Equipment	23.92	0.88	160.93	0.68
Total Other Mobile	150.08	379.71	1716.24	382.69
Total Mobile Sources	851.41	1126.18	7843.31	1167.46
Total	**1517.18**	**1361.38**	**7990.23**	**1419.13**

Table 2-13
Summary of Emissions
2010 Projected Planning Emission Inventory for the South Coast Air Basin
(Tons per Day)

Excluding Natural Sources
Base Year: 1990

Source Category	Summer VOC	Summer NO_x	Winter CO	Winter NO_x
Miscellaneous Processes				
Pesticide Application	13.84	0.00	0.00	0.00
Farming Operations	33.90	0.00	0.00	0.00
Contruction And Demolition	0.00	0.00	0.00	0.00
Entrained Road Dust - Paved	0.00	0.00	0.00	0.00
Entrained Road Dust - Unpaved	0.00	0.00	0.00	0.00
Unplanned Fires	0.74	0.24	10.57	0.24
Waste Disposal	6.20	0.00	0.00	0.00
Fugitive Windblown Dust	0.00	0.00	0.00	0.00
Other	9.55	2.92	1.80	2.92
Total Miscellaneous Processes	64.23	3.16	12.37	3.16
RECLAIM Allocations	---	28.21	---	28.21
Emission Reduction Credits	10.83	2.98	2.47	2.98
Total Stationary Sources	734.50	106.15	199.99	121.07
Mobile Sources				
On-Road Vehicle				
Light Duty Passenger	105.36	119.25	991.79	131.26
Light And Medium Duty Trucks	32.93	77.18	499.47	84.01
Heavy Duty Gas Trucks	8.69	45.05	85.06	40.48
Heavy Duty Diesel Truck	42.98	272.32	197.76	271.35
Motorcycles	5.39	1.92	25.44	2.14
Heavy Duty Diesel Urban Buses	2.01	10.34	9.36	10.30
Total On-Road Vehicles	197.36	526.06	1808.88	539.54
Other Mobile				
Off-Road Vehicles	39.09	12.77	168.05	10.89
Trains	1.75	34.71	5.71	35.29
Ships	1.23	33.84	2.61	33.40
Aircraft - Government	6.34	2.67	14.13	2.67
Aircraft - Other	14.54	17.70	89.48	17.70
Mobile Equipment	95.70	346.27	2079.24	351.92
Utility Equipment	3.69	1.73	69.60	1.33
Total Other Mobile	162.35	449.70	2428.82	453.21
Total Mobile Sources	359.71	975.76	4237.70	992.75
Total	**1094.21**	**1081.91**	**4437.69**	**1113.82**

Table 2-13
Summary of Emissions
2010 Projected Planning Emission Inventory for the South Coast Air Basin
(Tons per Day)

Excluding Natural Sources
Base Year: 1990

Source Category	Summer		Winter	
	VOC	NO_x	CO	NO_x
Stationary Sources				
Fuel Combustion				
Agricultural	0.00	0.01	0.00	0.01
Oil And Gas Production	1.45	0.20	2.69	0.20
Petroleum Refining	2.15	1.86	22.38	1.86
Other Manufacturing/industrial	6.52	19.78	40.68	21.15
Electric Utilities	0.36	0.30	1.78	0.30
Other Services And Commerce	7.77	14.87	50.19	16.54
Residential	1.02	25.47	23.16	37.35
Other	2.63	1.70	24.79	1.70
Total Fuel Combustion	21.92	64.19	165.67	79.11
Waste Burning				
Agricultural - Debris	0.04	0.00	0.19	0.00
Range Management	0.21	0.00	3.29	0.00
Incineration	0.32	1.15	0.97	1.15
Other	0.80	0.88	2.11	0.88
Total Waste Burning	1.37	2.03	6.56	2.03
Solvent Use				
Dry Cleaning	15.15	0.07	0.00	0.07
Degreasing	69.49	0.11	0.02	0.11
Architectural Coating	83.01	0.00	0.00	0.00
Other Surface Coating	166.27	0.60	0.43	0.60
Asphalt Paving	3.43	0.00	0.00	0.00
Printing	14.11	0.06	0.02	0.06
Consumer Products	110.01	0.00	0.00	0.00
Industrial Solvent Use	16.45	0.07	0.01	0.07
Other	4.38	0.02	0.02	0.02
Total Solvent Use	482.32	0.93	0.50	0.93
Petroleum Process, Stoarge and Transfer				
Oil And Gas Extraction	17.56	0.23	0.29	0.23
Petroleum Refining	23.79	1.68	6.31	1.68
Petroleum Marketing	57.75	0.06	0.02	0.06
Other	4.08	0.11	1.05	0.11
Total Petroleum Process, Stoarge and Transfer	103.18	2.08	7.67	2.08
Industrial Processes				
Chemical	11.41	0.49	0.73	0.49
Food And Agricultural	25.59	0.13	0.01	0.13
Metal Processes	0.91	0.89	2.19	0.89
Wood And Paper	0.01	0.01	0.00	0.01
Other	11.87	0.08	0.04	0.08
Total Industrial Processes	50.62	2.57	4.75	2.57

Appendix B

Estimated 2010 Stationary Source Reductions Summary

SOUTH COAST STATIONARY SOURCE FIP MEASURES

	NPR REDUCTIONS			NFR REDUCTIONS				
	2010 VOC	2010 NOx	2010 VOC	2010 VOC	2010 NOx	2010 VOC	RE adjustment	2010 reductions
FIP CATEGORY SPECIFIC MEASURES								
Architectural Coatings	103.9	na	26.0	83.0	na	20.8	0.8	16.6
Aerosol Paints (draft CARB limits)	14.8	na	8.9	15.4	na	9.2	0.8	7.4
Pesticides	16.0	na	3.1	7.1	na	2.3	0.8	1.8
Service Stations	25.0	na	8.9	21.0	na	5.6	na	5.6
Consumer Products (CARB limits)	116.8	na	27.5	94.6	na	in baseline		na
Fugitives	21.9	na	5.2	32.3	na	3.9	0.8	3.1
Livestock Waste (includes ethane)	62.4 *	na	11.8	33.9	na	na		na
Waste Burning	1.3	na	0.3	1.3	na	0.3	0.8	0.2
FIP Category Specific Totals		na	91.7		na	42.1		34.8
DECLINING CAP PROGRAM								
Reduction from Remaining Stationary Source Inventory		na	80.0		0*	50.0	0.8	40.0
182(e)(5) MEASURES								
Additional Reductions from Stationary/Area Sources		80.1	469.5		7			218
SIP Measures		62.0	63.0		0			227
TOTAL STATIONARY SOURCE REDUCTIONS		142.9	641.2		7			520
Stationary Source Remaining Emissions					99			207

2010 Stationary Source Reduction Summary	NPR REDUCTIONS				NFR REDUCTIONS			
	1990		2010		1990		2010	
	NOx	VOC	NOx	VOC	NOx	VOC	NOx	VOC
Stationary Inventory	256	899	212	757	235	666	106	727
Stationary Inventory Target			69	116			*99*	*207*
FIP Reductions								
Credit for SIP Measures, including SIP 182(e)(5)			63	62			0	227
Category Specific FIP Measures			0	92			0	35
Declining Cap Program			0	80			0*	40
FIP 182(e)(5) measures			80	406			*7*	*218*
Emission Reductions			143	640			7	520

TBD = to be determined

na = not applicable

* NOx cap program is expected to achieve the same amount of reductions as the SCAQMD RECLAIM program.